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FUELS AND RELATED EQUIPMENT

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MODELING OF THE ENERGY BALANCE OF AN ECONOMIC REGION

Yerevan PROMYSHLENNOST' ARMENII in Russian No 7, Jul 78 pp 50-51

[Article by Kandidat of Technical Sciences S. O. Grigor'yan]

[Text] The methods of linear programming and structural analysis are used to establish the quantitative relationships of an energy balance. A number of problems involved can be solved by computer. It is necessary to select from all the possible variants the optimal one, the primary criterion for which is prospective economic indicators. This problem cannot be solved at a single stroke, but only step by step, with sequential and systematic solution of the individual problems.

The energy balance as a whole is based on both indigenous raw materials and on importable ones (coal, oil, natural gas, water and so on).

The initial forms of thermal energy and the scope of their consumption are so complex that they cannot be reduced to a single balance which accounts for all their qualitative differences. Accordingly the current practice is to employ a system of partial and summary energy balances which are subdivided into energy, fuel processing and energy conversion balances.

The development of a summary balance is aimed at attaining an equibrium between the extraction (sources) and consumption of the individual forms of energy, reflected in natural units. Accordingly the main task involved boils down to the establishing of component energy balances and their coordination. Only through such an approach is it possible to evaluate correctly the available resources of the various forms of energy, formulate the requirements for their optimal development, and also determine the requirement for final forms of energy which corresponds to the tasks assigned to production and the extent of losses under the chosen solution. The materials developed in this manner will serve the next stage of planning for the processing of a single variant of the energy balance in which by gradual solution of the individual interconnections existing in the intermediate balances the necessary equilibrium between sources and consumption is struck.

Some requirements for a mathematical model can be formulated on the basis of accumulated knowledge and experience in developing energy balances. In the first place, the model must reflect the necessary relationships between sources of primary forms of energy and the quantity of this energy. Accordingly it must take account of the interrelationship between the primary forms of energy available to us for further conversion and the capacities of individual facilities for carrying out these conversions; it must also reflect the dependencies and relationships between the results of conversion and the ultimate consumption of the various forms of energy in the consuming sector. Every requirement or demand for a given type of energy, by industry, construction, agriculture, foreign trade or any other sector of the nationsl economy must be reflected in the balance of finished forms of energy and vice versa.

During the consideration of individual requirements, a number of limiting conditions, such as natural ones, which determine the quantity and quality of the initial forms of energy, must be taken into account. Consideration must be given to: the requirement for efficient utilization of all forms of energy; the existence of capacities for conversion of individual forms of energy and of units to transmit or transport energy; and also the characteristics of the industrial processes in use--changes which generally require a more profound intervention in production and in the organization of the entire productive process.

Thus the mathematical model of the energy balance has the following advantages over other similar models: first, it makes possible the conducting of in-depth studies of the possibilities for optimal utilization of forms of energy during the various conversion processes, and the study of scarce forms of energy, finding minima for consumption or loss where necessary as well as maximum expenditures for accessible forms of energy. Second, it affords the possibility of analyzing individual requirements for increased product output both in terms of the capacities of the individual units and plants and in terms of the requirements for primary forms of energy and accompanying energy losses.

Use of the mathematical model makes possible: rapid determination of the effect of equipment and plant capacities, along with a more profound study of the relationships between individual types of energy within units and plants; and the conduct of more specific studies of individual manufacturing and production processes in terms of the requirements and the development of the national economy, selecting the variants which are the most expedient in a given stage of development of the energy base and of fulfillment of the assigned tasks.

The mathematical model can be used not only in the energy area but also for other more or less closed complexes. Currently there is a need to develop models which will make possible the fuller study of the quantitative aspect of expansion of socialist production at all management levels and also the planning of the energy economy.

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FUELS AND RELATED EQUIPMENT

OIL REFINING INDUSTRY COMPUTER CENTER DESCRIBED

Baku VYSHKA in Russian 12 Sep 78 p 2

[Article by O. Nechipurenko, "Oil Refining's Electronic Brain"]

[Text] The teletype in the computer center of the Ministry of the Oil Refining and Petrochemical Industry of the republic comes to life at 8:30 AM.

"This is when the first data on the production of the main types of oil products in the plants begin to arrive," says operator E. Nazarova, "and each enterprise is producing as many as 50 different products."

Under the leadership of senior engineer S. Mamedova, operators of the information reception, monitoring and dispatching department R. Bakhtiyeva and G. Grigoryan spend a few minutes processing the data which have arrived at the center, preparing the information for transfer to punchcards. Each card contains several indicators: the quantities of oil products produced and sold. And if the plan is not fulfilled, they indicate the reasons.

Next the tables are sent to the group who prepare the data media, or in other words the punchcards; senior operators of the operations department M. Talybova and M. Gadzhieva translate them into machine language. And finally the finished punchcards are fed into a third-generation YeS-1020 computer and within 15 minutes are turned into a finished daily report on the production and movement of oil products during the last 24 hours. The production of eight enterprises is worked up into an accurate table in an hour and a half.

This is especially important in a period of agricultural toil, when the efforts of the oil refiners are directed in large measure toward assuring that the equipment in the fields can operate without interruption.

The precise and timely data on the quantity of gasoline, kerosene, diesel fuel and lubricants produced on the various units make possible operational shifts from production of one product to production of another. They told me at the

ministry's production department that on the basis of the daily report the catalytic and thermal cracking units at the NBNZ imeni Vladimir Il'ich and the BNZ imeni the 22nd Party Congress might if the situation warranted it be switched from the production of aviation fuel to motor vehicle fuel. And many other similar examples could be cited.

But this is only one of the tasks which are simultaneously performed by the personnel of the computer center. Among them are: accounting for the movement of fixed capital at the plants, monitoring the filling out of documentation, optimization of planning and a number of others.

The operations department is the heart of the computer center. It is here that the programs on which the computers work are made up, and everything possible is done to decrease the machine time required for performance of each task.

"While the accounting-for-movement-of-fixed-capital program used to take 2 1/2 hours," says group leader G. Panaseyko, "now by storing the program efficiently on a magnetic disk we have cut off almost an hour."

But the effective writing and timely and correct calling of a computer program is only part of the job. It is important to keep the computer working smoothly and without interruption. The skillful and conscientious work of the specialists of the technical services group, engineers N. Aliyev and O. Asadzade and technician I. Naumov, aids in the achievement of this aim. It sometimes happens, particularly when the work is intense, that malfunctions develop in the machinery. And it is important to eliminate them immediately.

The corridors of the computer center are silent, and there is only a steady din in the room where the computers are running. But intense work is under way in all the departments. The cluster computer center of the Ministry of the Oil Refining and Petrochemical Industry, built just over two years ago, achieved its planned capacity a year ahead of schedule. Now it has become the main link in the automated system for control of oil refining and has already saved the industry hundreds of thousands of rubles.

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FUELS AND RELATED EQUIPMENT

PAVLODAR-EKIBASTUZ COMPLEX PROGRESS AND PROBLEMS DESCRIBED

Moscow PRAVDA in Russian 1 Aug 78 p 2

[Article by B. Isayev, First Secretary, Pavlodar Obkom, Communist Party of Kazakhstan: "By Joining Forces"]

[Text] One of the most important concerns of our oblast party organization in recent years has been the organization of the Pavlodar-Ekibastuz Territorial Production Complex. It has been necessary to develop new sectors in an area where owing to historical circumstances there was no indigenous construction industry, no skilled metallurgists or energy workers. All of these exist now.

A great industrial center with powerful modern enterprises has arisen on the banks of the Irtysh. An economic potential has been developed in this oblast which will enable us to accomplish the great and responsible tasks assigned to us by the 25th CPSU Congress.

The scale of the work awaiting us is immense. For example, more than 7 billion rubles has been allocated for the development of the Ekibastuz fuel and power complex by the state. The output of coal from the opencuts here is to be increased 3 1/2 times, rising gradually to 170 million tons a year. Four GRES with a total capacity of 16 million kilowatts are to be built quickly near Ekibastuz. The July 1978 plenum of the CC CPSU accorded great significance to speeding up the reconstruction of the Pavlodar Tractor Plant. In order to produce the heroic K-71 on the banks of the Irtysh it is necessary to build an essentially new tractor plant, one where many thousands of workers will be employed.

In a word, a complex program has been adopted. How can we assure success? We believe that it can be done primarily by unremittingly raising the level of organizational and political work and improving the style of party leadership of the oblast economy.

At an obkom plenum held not long ago, the course of fulfillment of the party directives and our own decisions relating to the development of the fuel and power complex and the reconstruction of the tractor plant were comprehensively analyzed. The communists noted that stricter monitoring of the implementation of the decisions is being instituted in the oblast. A procedure has become firmly

established under which the most important decrees are removed from control only by decision of the obkom bureau after preliminary checking of their actual implementation on the spot. If the decrees have not been completely fulfilled, additional steps toward their realization are taken. The obkom and the municipal and rayon committees have begun to inform the communists regularly about the fulfillment of the decrees of the plenums, considering this work as an effective way of strengthening performance discipline.

Without a high level of performance discipline, success is quite unthinkable in any activity. But in the case of decisions assigning tasks on such a large scale, the responsibility of each person for his assigned part must double: in the carrying out of comprehensive programs, inadequate work in one link can negate the work of thousands of people. During the first months of construction of the Ekibastuz fuel and power complex we frequently had to deal with such inadequate work. For subdivisions of many ministries many municipalities in the oblast and even the republic were taking part in the construction of the giant of the steppes. And this prevented one leader from timely solution of the problem of lack of promptness or "forgetfulness," while another would not take the risk of overcoming the departmental barrier. Meanwhile the problem was "settling in" and things were at a standstill.

First of all we stepped up our inquiries about such situations. We can say that not one of them now lacks the constant attention of the party.

As work proceeds we are having to correct certain errors which were allowed in the selection and placement of leaders. Thus, the first director of the Ekibastuzenergostroy [Ekibastuz Power Construction] Trust turned out to be simply inadequate for the project. The second, after working for some time, felt that he was not "up to it" and tendered his resignation. Now E. Filatov, a young worker of good experience and energy, has been designated director. He assumed his duties enthusiastically and is able to make demands on his subordinates and to stimulate them. The obkom and the Ekibastuz gorkom are taking the necessary steps to complete the organization and stabilization of the staff of the trust.

An increased sense of responsibility and the development of initiative on the part of the operations leadership and specialists is made possible by business-like discussion of their reports at party meetings and committee plenums. We had the first such experience in the party organizations of the Yermak Ferroalloy Plant and the Pavlodar Aluminum Plant. We supported it. Now the reports of trust heads and the directors and specialists of construction organizations and enterprises are a practice of many primary party organizations.

In order to coordinate the activities of various subdivisions of this important construction project, to solve problems as they arise and to strengthen performance discipline at the sites we have created an oblast commission on construction. It is headed by one of the party obkom secretaries. The commission includes the heads of trusts and the leaders of enterprises participating in the construction of the complex. Without substituting for anyone, the commission helps to coordinate the work of associated organizations and to solve quickly

the problems that arise on the construction sites. It also hears the reports of the oblast and municipal leaders of trade, domestic-service, health care and cultural services. As we well know, without good cultural and domestic conditions we can hardly expect good work. The commission generally assigns precise tasks, sets precise and well-chosen completion dates and makes strict inquiries regarding performance.

Here it should be noted that great assistance in seeking out effective methods for party control of construction and influence on its pace has been given us by the CC of the Communist Party of Kazakhstan. In the decree which it adopted jointly with the Council of Ministers of the Kazakh SSR on the Ekibastuz fuel and power complex the goals of many republican ministries and planning and research organizations are defined. Now their party committees are maintaining close contact with our gorkoms and party obkom. We discuss the most complex problems together and carry our undertaking through to the end with united forces. The responsible ministry personnel participate in the sessions of the oblast commission on leadership of the construction project.

Are all these measures succeeding in accelerating the construction of the complex? Unquestionably they are. We have succeeded, even if not fully, in eliminating the lag which resulted in the initial period from certin limited instances of disorganization. The construction of the GRES-1 is in full swing. Preparations for the construction of the second thermal power station have begun.

But nonetheless, this is only a beginning. The size of the capital investments in the complex will grow every year: we shall have to work even more intensely in the future. Therefore we must continually search for new latent potential for the improvement of our activities.

We perceive great possibilities in the dissemination of advanced experience and the further development of socialist competition, which has produced many valuable initiatives. These must be supported actively and the way opened for them.

The competition under the slogan "Bring each complex and unit to its planned productivity," for example, has helped us to tap significant potential. This initiative was presented by the advanced brigades of the Ekibastuzugol' [coal] association, the Pavlodar Aluminum and Tractor Plants and the Yermak Ferroalloy Plant. The bureau of the party obkom approved it, and its organizational work helped to disseminate it widely among the collectives of the oblast.

Not all our efforts, however, are producing the desired results. We can see how much more must be done in order to improve our organizational work. The party committees in the oblast sometimes lack the militancy and skill to concentrate on the main undertakings. When the obkom has heard the reports of the municipal committees, we point out faults, discuss how to correct them and direct attention to effective experience. More attention too must be paid to strengthening the primary party organizations on the new construction projects and to certain other pressing problems.

There are also a good many problems whose solution depends on organs outside the oblast. Why, for example, is the Ekibastuzugol' production association so frequently in a fever? It is because of serious miscalculations in planning allowed every year by the USSR Ministry of the Coal Industry. The association has a high rate of labor turnover. In recent years there has been an almost complete turnover in its labor force, several thousand strong. We have frequently appealed to the Ministry of the Coal Industry to solve this problem, but so far without result. And the miners will soon have to begin providing a large input of fuel from the mines to the furnaces of the Ekibastuz GRES's. Who will do this, if there are already not enough miners?

In general terms, if you analyze the first stage of the emergence of the giant of Ekibastuz, you will see that in many sectors of the construction project, problems are becoming increasingly acute, to the point that they will produce serious consequences in they are ignored any longer. Although the implementation of large and complex programs is far from a new undertaking in our economy, nonetheless our operational thinking still lacks the necessary breadth and consistency. Sometimes attention is concentrated on a narrow sector related to the main one and the strengthening of the other links on which the strength of the entire chain depends is neglected. Life exacts a heavy penalty for such shortsightedness.

It has long been realized that in the eastern regions of the country the primary attention must be devoted to questions of dwellings and social, cultural and domestic-service facilities for the major construction projecs. This idea was frequently stressed in the discussions during Comrade L. I. Brezhnev's visit to Siberia and the Far East. And what is the situation now in Ekibastuz? The Ministry of the Coal Industry and the USSR Ministry of Power and Electrification, which are stepping up the commisioning of productive capacities, are, with enviable persistence, "forgetting" about dwellings. No matter how much the Pavlodar party obkom requests action on this problem, they meet with no comprehension from the union-level departments. The gap between the increasing quantity of work and the possibilities for settling and supporting people is increasing daily.

This, for example, is the situation at the tractor plant. Over the past ten years considerably fewer resources have been allocated for social facilities for this collective than was proposed. The plant is experiencing an acute need for dwellings and chindren's preschools.

It would seem that such a disproportion could not be allowed under any conditions during the construction of a new tractor enterprise. However, judging by the technical and economic substantiation developed by the Giprotraktorsel'mash Institute [Institute for Planning of Tractor and Agricultural Machinery Enterprises], municipal operations, trade, education, health care, culture and domestic service facilities with an approximate cost of 125 million rubles were excluded from the summary expenditures.

Since the complexes whose development in the Irtysh region is called for in party and state decisions are not isolated areas, but a component of the regional economic organism, it is important to raise all other production to the level of the new tasks. The capacities of the aluminum and ferroalloys plants and other large enterprises in the oblast are now increasing smoothly. In order to assure the industrial workers high-quality farm and agricultural products, the party obkom is taking all possible steps to develop agriculture further. In the light of the decisions of the July 1978 plenum of the CC CPSU, measures to accelerate land reclamation in the Irtysh-Karaganda Canal area and to complete construction of the Yermak Broiler Factory have been planned.

The party organization of the oblast will, by unifying the efforts of all collectives, continue to accomplish persistently the multiplicity of tasks of development and improvement of the Pavlodar-Ekibastuz Territorial Production Complex.

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FUELS AND RELATED EQUIPMENT

WAYS OF PROLONGING OIL-WELL PUMP LIFE OUTLINED

Baku VYSHKA in Russian 13 Jul 78 p 2

[Article by Dr of Technical Sciences A. Amirov and Kandidat of Technical Sciences I. Prok: "A Long Life to the Subsurface Pump"]

[Text] The successful accomplishment of the tasks relating to improvement of oil output from long-established formations and stabilization of the level of oil output in old fields assigned by the 25th CPSU Congress and the 29th Congress of the Communist Party of Azerbaydzhan depends to a considerable degree on the fundamental improvement of equipment and processes in mechanized oil extraction, especially the pumps.

In recent years a major effort in this direction has been made by AzNIPINeft' [Azerbaydzhan Scientific Research and Planning Institute of Petroleum], the Neftemash [Oil Machinery] Special Design Bureau, the Machine-Building Plants imeni F. Dzerzhinskiy and Lieutenent Shmidt, the specialists of the Azerbaydzhan Institute of Petroleum and Chemistry imeni M. Azizbekov, VNIIPTneftemash [All-Union Scientific Research, Planning and Technical Institute of Petroleum Machinery], the Azerbaydzhan Polytechnic Institute imeni Ch. Il'drym and the oil workers themselves. The reconstruction of the country's base enterprise for the production of subsurface-rod sucker pumps, the plant imeni F. Dzerzhinskiy, has been completed. Many new designs and sizes of pumps have been developed, along with modifications for complex working conditions. In certain oil and gas extraction enterprises, the shops for the checking, pressure testing and selection of new pumps for specific wells and repair and reuse of worn-out pumps have been expanded and equipped.

The subsurface-pump method of extraction continues to be the primary one in the oilfields of Azerbaydzhan. It is currently being more extensively incorporated in the oilfields of Tataria, Bashkiria, Tyumen' and other regions of the country as well. Recently the importance of subsurface equipment for oil extraction, rod and electrical rotary pumps, has increased immensely.

Currently more than 50,000 wells are being operated with rod pumps, and a fifth of these are in the oilfields of Azerbaydzhan. But while one or two pumps a year are used in the operation of a well in the eastern parts of the country,

the figure is about 5 in the Baku oilfields and even higher for a large group of low-output wells. The reason for this is primarily that the operating conditions for subsurface rod pumps are significantly more difficult in the oilfields of our republic than in the eastern areas. In our oilfields the degree of natural lubrication of the moving parts of the pump by the liquid in the well itself is unusually low because of the high water content of the product and the decreasing percentage of oil in it. Wear from mechanical impurities (sand), the corrosive effects of waters and so on also have a major influence on the service life of the pumps. In wells which are being operated on stepped-up regimes, the high linear speed (with long plunger travel and large walking-beam movements) lead to even faster wear of pumps and their parts.

These difficult working conditions for subsurface pumps must be countered by a complex of engineering and geological measures, the most important of which are, in our opinion:

first, the fixation of sand in the bottom-hole region of the well while maintaining the natural permeability of the formation, or removal to the surface of the entire quantity of sand entering from the formation, without harm to the working surfaces of the pump;

second, steady improvement of pumps, pump casings and rods, improvement of the quality of their fabrication and assembly, and improvement of wear resistance under the harsh conditions described above;

third, organization of production and massive incorporation of various protective accessories on rod pumps, as well as special pumps for pumping out large quantities of liquid and for removing large quantities of sand;

and, finally, improvement of production efficiency in the oilfields, systematic improvement of the subsurface-pump process of oil extraction, the resumption of systematic study of oil wells, the extensive incorporation of engineering and geological measures to lengthen the period between repairs and the pump service life, and correct selection of pumps for specific well conditions.

We are conducting major efforts in all four areas mentioned./But in our view they are still not producing the required effect, since they are being conducted piecemeal, without a unified, comprehensive plan and a unified, carefully coordinated technical policy./ [passage in boldface type]

This was clearly pointed out, in particular, by the recent scientific-technical conference organized by the Azneft' association jointly with AzINEFTEKHIM [Azerbaydzhan Institute of Petroleum and Chemistry] imeni M Azizbekov, AzNIPINeft', the Neftemash Special Design Bureau, AzNTO [Azerbaydzhan Scientific and Technical Society] of the Oil and Gas Industry, the Baku branch of the Znaniye Society and the Machine-Building Plants imeni F. Dzerzhinskiy and Lieutenant Shmidt.

Thus, for example, in recent years AzNIPINeft' has developed many new sizes and modifications of pumps for effective operation in deep low-output wells with high water content suffering from sand accumulation. But the most efficient areas for their utilization were not determined and their manufacture and incorporation were not organized. Many original design developments by a number of institutes relating to improvement of hydraulic characteristics of pumps, protection of the main assemblies by viscous fluids, lengthened or shortened plunger designs, barrel-less cup-packed plunger pumps, valve units and plungers made with plastic have undergone successful semicommercial testing but are not being used on the oilfields.

In short, various equipment and process innovations are receiving the warm approval of the oil workers at various stages, but their extensive incorporation is not being mandated. At the same time, the plant imeni F. Dzerzhinskiy is slow in mastering the production of new pump designs and is not making sufficiently energetic efforts to improve the quality of their manufacture.

In our view, joint work by oil workers and machine builders to sharply increase the operating reliability of subsurface pump equipment would be beneficial. It is necessary to establish a well-founded requirement for various types of gas anchors and to install them on all wells where the harmful effect of gas on pump operation has been established, which would unquestionably increase their efficiency. It is also necessary to organize major overhauls of pumping units and to produce spare parts for them. But the plants of the Soyuzneftemash [All-Union Petroleum Machinery] Association are fulfilling the oil workers' orders grudgingly. We mentioned pumping units on purpose, because such a device, even though not very complex, cannot be required to work continuously and around the clock for 30 years practically without repair (and the same thing is true of compressors).

A thorough and exacting engineering discussion at the above-mentioned congress suggests the necessity of organizing without delay a unified coordinating center, /a republican council for planning and coordination of work involving operation of wells with rod pumps./ [passage in boldface] Such centers, by the way, used to exist in the Azneft' association under the former republican Ministry of the Petroleum Industry, and then in the former State Scientific and Technical Committee of the Azerbaydzhan SSR. They had a fruitful effect on technical policy in the operation of rod pumps. Now, since machine-building plants, the Neftemash Special Design Bureau and several institutes have been split off from the oil industry into a separate sector, it is clear that it would be expedient for the purpose of increasing the authoritativeness of its decisions to create such a coordinating center in the republican Gosplan.

In lengthening the service life of pumps and increasing the effectiveness of operation of wells with rod pumps, much depends on the oil workers themselves. In addition to constantly improving oil extraction processes, it is necessary to raise the overall production efficiency and the level of research work. One cannot, for example, lower into the well the first pump which comes to hand

without checking it carefully and taking into account the characteristics of the particular well. The pumps must be /specially selected/ according to the relevant instructions, tables and nomograms. It is even less permissible to transport the pump from the plant to the oilfield and then to the well to be repaired using transportation not adapted to the purpose. The transfer of these functions to the Administration of Production Equipment Maintenance and Full-Set Delivery of Equipment and its local branches must be accelerated. This will free many workers and transport facilities and--the main thing--will sharply decrease damage to pumps in transit and eliminate their incorrect employment. The central pump repair and rebuilding shop organized at the Central Production Maintenance Base of the Azneft' association must be quickly equipped with the required equipment and spare parts. The example of such a department in the Karagandaneft' association indicates that this will speed up the acquisition of the new pumps which are required in ever-increasing quantities on the oilfields of the eastern parts of the country and in Western Siberia.

It is necessary to work persistently to solve the problems associated with the harmful effects of sand on rod pumps, their components and the wells themselves. It seems likely that the scientific organizations of the republic are able to develop formulas for special plugging materials and a process for fixing sand in the bottom-holes of the wells while maintaining their permeability and to work on the development of special gravel filters at the bottom holes. At the same time the oil workers, in cooperation with scientists, should develop and incorporate the most efficient regimes for pumping liquid from wells which are subject to frequent sand plugging withoug significant wear on pumps and their components from the sand.

Much also must be done in the machine-building plant imeni Lieutenant Shmidt toward lengthening the service life of pump rods and rod couplings, particularly in deviated and slant wells, the number of which is increasing every year. In this context the protective rod couplings developed by engineer K. Daizade merit attention.

The comprehensive and systematic implementation of well-conceived measures in all four areas mentioned above and friendly common efforts by the oil workers, machine builders and other workers will help confer longer life on the subsurface pumps.

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FUELS AND RELATED EQUIPMENT

FIRST SUPER-DEEP WELL IN SIBERIA PLANNED

Moscow NEDELYA in Russian No 36, 4-10 Sep 78 p 4

[Article by A. Kucharov]

[Text] The drilling of the first super-deep well in Siberia is beginning. A 60-meter drilling rig has been set up in the Omsk Depression. The collective which is assigned this super-deep experimental well is also ready for work.

The multi-ton bulk of the rig was installed by a rather unusual method: starting from the top. The installers, led by N. Kazachenko, made the top section, put it on supports, and then built the next section below it, lifted the derrick with cranes and once again put supports under it, continuing in this manner to the foundation. The entire assembly was completed in six days.

Why is this experiment being made? In Western Siberia there are now many artesian oil and gas wells. But these only reach maximum depths of 2-3 thousand meters. What is there further down, in the formations that were on the bottom of the prehistoric ocean which roared above this territory? What does the Western Siberian Platform "feel" like, what is its detailed structure? In order to obtain an answer to these questions, the geologists and geophysicists of the Siberain Branch of the USSR Academy of Sciences have assigned the specialists of the Novosibirsk Geological Administration an honored task: to be the first to penetrate into these unprecedented depths. The drillers are to reach the Paleozoic basement rock in two years.

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FUELS AND RELATED EQUIPMENT

DELAYS IN DOCUMENTATION FOR PIPELINE CONSTRUCTION

Moscow STROITEL'NAYA GAZETA in Russian 2 Aug 78 p 1

[Article by R. Yevseyeva, correspondent, Ministry of Construction of Petroluem and Gas Industry Enterprises press section: "Miscalculations Costing Millions"]

[Text] "The Petrovskoye-Yelets gas pipeline?" repeated Semen Grigor'yevich Shal'skiy. "Yes, the construction is supposed to begin next year. But I can't tell you anything more definite, because I don't know myself," he added sadly.

This seemingly strange lack of knowledge on the part of the chief of the engineering division of the Mosgazprovodstroy [Moscow Gas Pipeline Construction] Trust, whose builders are scheduled to start laying a new 320-kilometer gas line next year, is explainable. To this day the general contractor has not received a single page of technical documentation.

"It's hard to hold out the hope that we'll have it in full by 1 September," continues S. Shalskiy. "Neither Mostransgaz [Moscow gas transport organization], the requester, not the planners at VNIPITransgaz [All-Union Scientific Research and Planning Institute of Gas Transport] in Kiev will promise a thing."

It is a strange picture, but alas, a familiar one to many builders. No plans, no estimates.

One of the country's most important construction projects is the Urengoy-Chelyabinsk trunk gas pipeline, in the second stage of which the trust's builders are to continue the course from the 731st to the 879th kilometer. The plan for next year's work was to add up to 58 million rubles. By the end of June only the drawings for the linear part from the 731st to the 874th kilometer had been received from the planners at the Kiev Soyuzgazproyekt [All-Union Gas Planning] Institute: there are no plans for the beginning and the end of this section. And these documents were sent without technical sections, without valve assemblies, without plans for the electrochemical protection and communication lines, without estimates, so that 20 million rubles can be deducted from the cost of this future work. How is the plan to be fulfilled?

And why talk about the projects for 1979 when the full documentation is lacking for many on which construction is already in full swing! For example, the

subdivisions of the trust have been working since last year on the first 540 kilometers of the Tol'yatti-Gorlovka-Odessa trunk ammonia pipeline. But to this day the builders lack the engineering drawings and the information on the location of the shutoff valves for the entire course, and there is no documentation for work on electrochemical protection and the construction of the electrical transmission line on the section from the 350th to the 540th kilometer. The requester, the Ministry of the Chemical Industry, is putting them off with unreasonable promises.

The builders of the Surgut-Polotsk oil pipeline, the construction of 350 kilometers of which the trust has already begun, still have no engineering plan or drawings for the linear part, of almost 200 kilometers, the construction of the Gor'kiy pumping station or the laying of the underwater crossings of the Volga and the Vetluga. And even if the builders completely finish the linear part, it will not be possible to use the sector. It is strange that the management of the Upper Volga Trunk Oil Pipelines are so unconcerned and inactive and that the planners of Giprotruboprovod [Planning Institute of Pipeline Construction] and TurkmenNIPINeft' [Turkmen Scientific Research and Planning Institute of Petroleum] are so dilatory.

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FUELS AND RELATED EQUIPMENT

COAL ENRICHMENT PLANT IS MODEL FOR PLANNING, CONSTRUCTION

Moscow STROITEL'NAYA GAZETA in Russian 30 Jul 78 p 3

[Article by Doctor of Technical Sciences Ye. Petrenko: "The Correct Course of the Sibir'"]

[Text] It is well known that the coal that is extracted in the mines must be subjected to an initial process of enrichment--the removal of rock and undesirable impurities--in specialized factories, and that only after this can coke be obtained from it. The Sibir' Central Enrichment Factory with a capacity of 5.6 million tons of coal a year, built in 1975 in the southern Kuzbass, is called upon to solve this problem. The plans were developed by Sibgiproshakht [Siberian State Institute of Mine Planning], KuzNIIUgleobogashcheniye [Kuzbass Scientific Research Institute of Coal Enrichment], KuzNIIShakhtostroy [Kuzbass Scientific Research Institute of Mine Construction], Kemerovograzhdanproyekt [Kemerovo civil engineering planning organization], Sibgiprotrans [Siberian State Planning Institute of Transportation] and other organizations.

The Sibir' factory is one of the largest in the Soviet Union. It is capable of enriching caking coals of grades K and Zh. The planning solutions of the enterprise deserve high marks for the following reasons: the water-slurry system with combined floatation of liquid pulps which was developed, in combination with the universal flowchart and the new equipment make possible the enrichment of coal of any level of enrichability and the obtaining of a product of guaranteed quality.

In order to make thrifty use of the land allocated for the construction and to save on mains within the site, the plan called for optimal grouping into blocks of the buildings and installations. For example, the bunker for imported coal, the bunker for unloading of defective cars, the main facility and the workshpos, the radial concentrators and the slurry pits are all under a single roof. In planning the factory efficient use was made of the topographical conditions of the site, which made it possible to maximize site development and significantly decrease the quantity of transport mains between the various departments. Even the building site itself was well chosen, allowing for cooperation with other enterprises and the possibility of building a second stage of the enterprise.

Also fundamentally new are the equipment configuration solutions. The bases of the main facility, where the main coal enrichment processes are carried out, are organization into sections, unitizing of equipment, the flow approach, and the principle of grouping. As a result the machines and equipment are so located as to afford convenience and efficiency of servicing, repair and replacement. Standardized building designs have been used, making possible full implementation of the above-mentioned principles of organization.

Powerful conveyors with belts up to 2,000 mm wide were installed to move coal to the bunkers and from the storage facility. This made possible a significant decrease in time spent on handling operations. Several new types of machinery and equipment have been introduced into basic and ancillary activities.

Much that is new and progressive has been utilized in the development of the construction part of the plan. The parameters of buildings, facilities and prefabricated construction members have been unified for the facility. A high level of prefabrication has been attained: 1,870 cubic meters of reinforced concrete, involving 1 million rubles worth of construction and installation work, 30 percent more than planned.

The adoption of a pavilion-type structure for the main installation, with two 24-meter spans, a column space of 12 meters and a height of 25.2 meters made it possible to install the smaller units and process equipment elements with overhead traveling cranes during the construction process.

Considerable attention was devoted to planting the grounds, to the development of rest areas and to the system of cultural and domestic services for the workers. All the administrative, domestic, health-care and ancillary services and social organizations are concentrated in one complex which is joined by a brightly lit, heated above-ground passage to the main facilities. The interiors of the production departments were developed with attention to the current requirements of production esthetics. The architectural appearance of the Sibir' factory is attractive as well.

Experience is confirming that the plan for the Sibir' factory was extremely felicitous. The board of the USSR Ministry of the Coal Industry has proposed to use it as a model for construction of enrichment plants with a capacity of 6 million tons of coal a year. The Sibgiproshakht institute developed a manual so that the individual sections and facilities could be applied again. Labor productivity in this enterprise is about twice what it is in others, while the production cost of coal processing is two-thirds as high. In addition, a considerable economic effect has been realized through lower construction costs, fuller recovery of the coal from the rock and other measures.

The contractors of Kuzbassshakhtostroy made a great contribution to the development of this modern enterprise. They made use of progressive work methods and a progressive form of construction management. Thus the SUPER automated system was introduced, resulting in efficient and on-time truck hauling of concrete and mortar.

The experience of planning and building the Sibir' factory is described in the exhibits of the Exhibition of the Economic Achievements of the USSR.

Mastery of the productive capacities is proceeding well. For the high production indicators which it achieved in the all-union socialist competition, the collective of the Sibir' has been awarded many Challenge Red Banners of the USSR Ministry of the Coal Industry and the coal industry trade union central committee. The awarding of a prize by the USSR Council of Ministers for the development of this modern coal industry enterprises would, it seems to me, be a fitting culmination of the creative labor of the planners, builders and operators.

We may be assured that the accumulated experience will be extensively employed in practice.

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FUELS AND RELATED EQUIPMENT

COAL PRODUCTION UP WITH SMALLER BRIGADES

Moscow IZVESTIYA in Russian 26 May 78 p 1

[Article by IZVESTIYA correspondent V. Vukovich: "More Coal With Smaller Brigades"]

[Text] Many brigades of miners in Lvov under the Ukrzapadugol' [Western Ukrainian Coal] Association have achieved high quality results in their labor. They have a high average monthly coal output per worker, and the production cost of a ton of coal extracted on the Western Bug is lower than for the USSR Ministry of the Coal Industry as a whole.

Comrade L. I. Brezhnev's speech at the 18th Komsomol congress stressed that the struggle for efficiency and quality of work not only is a key task of the current five-year plan but also will be a vital factor in economic and social development for many years to come. In response, the best miners' brigades presented an initiative: to decrease the number of workers, increase average monthly labor productivity per worker and extract an above-plan quantity of coal.

At the request of IZVESTIYA correspondent V. Vukovich, the originators of this initiative tell how they are carrying out their plans.

More Creativity
A. Akimov, brigade leader of Velikomostovskaya Mine No 8

Our brigade is a constant participant in the all-union competition of "500,000-tonners." Extracting coal with a relatively small number of personnel is entirely possible if you take a creative approach toward the task, namely by improving processes and labor organization.

We have already been using the KM-87 mechanized complex for 12 years. In order to operate it with small teams and with greater productivity we began to improve

individual components of the equipment and develop small-scale mechanization devices. In all we introduced about 70 different efficiency proposals, which were eagerly adopted by miners from the other mines. Thanks to our multi-skill workers we are succeeding in combining operations or shortening them. All of this has enabled us to decrease the size of the brigade by 3 persons.

The striving to increase labor productivity by skill rather than numbers is basic to the five-year plan. We decided to extract 2.5 million tons of coal with a five-year average personnel complement of 50. In this way the average monthly coal output per worker will amount to about 900 tons, significantly surpassing the sector-wide figure.

A High Level of Skill
N. Shkolarenko, brigade leader of Velikomostovskaya Mine No 4

In the neighboring mines we meet with pleasure the people with whom we used to work. They have become good leaders of coal extraction brigades.

Newcomers are replacing the ones who left. We are trying to bring them quickly into our rhythm, to teach them and to impart our experience to them. We always do it this way, and it is how we maintain a good intensity of labor. This pays off. Last year we had to make 4 changeovers, but we still extracted 380,000 tons of coal. This year we are producing an average of 700 tons of coal a month per worker. We want to surpass our annual target.

We are looking for new latent potential to increase labor efficiency. Not long ago, for example, in addition to performing their direct responsibilities of putting the equipment in working order, the repair workers undertook to deliver timbers to the face ahead of time. Now the coal cutters can start to cut coal right away.

We see the possibility of freeing 3 persons from the brigade. They will go to new extraction collectives which will be required as a result of the shift to a 30-hour work week in the mines.

Increased Output
V. Rybinskiy, brigade leader of Velikomostovskaya Mine No 3

At the beginning of the year we switched to a formation with complex geological conditions. Under such conditions the number of workers is usually increased. But we managed with the same number as before. And we mastered the automated complex more quickly than usual, in a month. Our daily output on the wall surpassed 1,000 tons.

We have a small brigade of 62 men. Each of them is in view and on account, so the shift time is utilized to the limit. The brigade has experienced specialists. They have mastered several jobs and assure interchangeability.

Not long ago we decided to decrease the number of personnel in the collective by four. The benefit from this is obvious. When we are obliged to work with

a smaller number of people we distribute the additional load rationally so as to increase the average labor productivity per worker to 670 tons. For the year the brigade will extract 400,000 tons of coal, 40,000 tons more than the target.

The Initiative Supported
V. Dobrik, First Secretary, Lvov Party Obkom

Since the beginning of the Tenth Five-Year Plan, the miners of the Ukrzapadugol' Association have extracted 1.7 million tons of coal above plan. This became possible through a creative approach to our work.

The signs of this approach can be seen in many places. In the mines, a progressive method of two-combine coal extraction without preparation of the sections has been developed and has increased the combine machine time by 5-8 percent. A support which joins the face to the drift has come into use, enabling us to speed up the process of shifting the conveyor head. The introduction of stationary loaders for mechanized trimming of the face has eliminated manual labor. The efficiency improvers' movement has expanded considerably. Some 2,300 proposals have been implemented, resulting in a saving of 3 million rubles. We are realizing a considerable return from brigade competitions for output of 1,000 or more tons a day on a long wall. Today a third of the coal extracted in this basin comes from this competition.

In his speech at the December 1977 plenum of the CC CPSU, Comrade L. I. Brezhnev said: "Work better today than yesterday, better tomorrow than today: this is the slogan of the day. 'Better' means a stress on quality, on efficiency, on increased labor productivity." Responding to this call with action, the advanced brigades led by V. Rybinskiy, N. Shkolarenko and A. Akimov decided to compete under the slogan "More coal with smaller brigades."

The bureau of the Lvov party obkom approved the initiative of these advanced brigades. It was proposed to the party, trade-union and Komsomol organizations of the mines in the oblast to conduct organizational and mass political work for the expansion of the competition under the slogan "More coal with smaller brigades" and to give its participants all possible help and good engineering support.

The support of this valuable initiative of the pacesetters by the collectives of the other mines is enabling us to increase our output of above-plan coal. It is becoming possible to send the qualified miners who have been released to a high-priority construction project, the Velikomostovskaya Mine No 10, thus speeding up the mastery of its planned capacity. In addition, the party committees have been advised to cooperate in every way with the transference of the miners' initiative to other industrial enterprises and construction projects. This will help to fulfill well the assignments of the Tenth Five-Year Plan.

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FUELS AND RELATED EQUIPMENT

MOVEMENT TO DECREASE COAL MINING BRIGADE SIZE REVIEWED

Moscow IZVESTIYA in Russian 31 Aug 78 p 1

[Article by IZVESTIYA special correspondent V. Vukovich: "More Coal With Smaller Brigades"]

[Text] In IZVESTIYA No 123, the advanced miners' collectives of Ukrzapadugol' led by A. Akimov, N. Shkolarenko and R. Rybinskiy called upon miners to begin a competition under the slogan "More coal with smaller brigades." They declared that they are decreasing their numbers of personnel, increasing the average monthly labor productivity per miner and surpassing their commitments for fuel extraction.

The board of the Ukrainian SSR Ministry of the Coal Industry and the Presidium of the republican committee of the trade union of coal industry workers approved the initiative of the innovators and noted in their decree that many brigades in the Donbass were supporting it. It has been proposed to acquaint all miners with the partiotic initiative which originated in the enterprises of Ukrzapadugol' and to expand the competition for extraction of coal by brigades with smaller numbers of personnel. The report we publish today describes how the originators of the initiative and their supporters in the mines of L'vovskaya and Volynskaya Oblast are working.

It was in the middle of May that a group of experienced brigade leaders met with the Chervonograd party gorkom. Not all of them, of course, agreed with A. Akimov, N. Shkolarenko and V. Rybinskiy that it would be possible to work in the manner which they proposed. They argued that not everyone had the same geological conditions and equipment. But the authors held their ground with well-reasoned arguments, showing that others were following their example. This was how it came about.

When they heard at the Velikomostovskaya Mine No 4 that N. Shkolarenko was asking to decrease his group by five, S. Smolov, a brigade leader in a neighboring section, sought him out during the shift change.

"On our wall," he said, "the coal seam is half a meter thinner, and the combines don't have the same capacity as yours, but my comrades would like to try it your way. What do you think, can we manage?"

"Your people are workers," Shkolarenko reassured him. "Try to organize yourselves well and distribute the work intelligently and everything will work out. If anything happens, come ask about our experience. We'll be glad to help."

June and July passed. The economic service of the mine worked out the results of the brigades' work. Here they are. N. Shkolarenko's miners are among those who are holding the line with a thousand-ton output on their wall, working at a more intense pace, keeping their word. While during the first four months of this year their average output per worker was 728 tons, now it has increased to 788 tons. During June and July they extracted 5,700 tons of coal above their target.

Now let us mention something else. Not long ago the mine leadership asked Shkolarenko's people to help out a sector that had hit a snag. They did not refuse, even though they were working with decreased numbers. The brigade leader talked it over with each team, and they discussed how they should arrange their work when he went off with some of his people to cut coal on "someone else's wall."

Now, about S. Smolov's coal cutters. They have become well known in the basin, and deservedly so. Not everybody has succeeded, in such a thin seam as they have, and using two obsolescent 1K-101 combines, in bringing the output on their wall to 1,003 tons. The average monthly labor productivity per worker increased to 535 tons. A good figure. On the brigade's shock account are 12,500 tons of above-plan coal.

The results of the work of the collectives of the two other originators of the initiative also attest to the complete possibility of producing more coal with a smaller quantity of miners. By increasing the output on its wall by 230 tons over the preceding months' figures and the average output per miner by 70 tons, A. Akimov's brigade sent more than 11 trains of coal above target to the surface in June and July. For this result it received a first prize from the Ukrainian SSR Ministry of the Coal Industry.

V. Rybinskiy's coal cutters too are showing their zeal. Even though they have encountered geological complexities, their labor productivity per worker has risen to 107 percent. During the last two months, 10,200 tons of coal above their target has been brought from their wall. This has enabled the brigade to be numbered among the competition winners in the association.

The success of the innovators resides not only in their high personal labor activism. Their conviction that the new movement would be joined by many miners from the banks of the Western Bug has been fully borne out. The slogan "More coal with smaller brigades" has already been included in the armament of 34 extraction collectives. They have released 60 highly skilled workers, who

have been transferred to sections where there are not enough people. Moreover, all the supporters of the movement have reviewed their previous commitments. Thus 53,100 tons of coal has been added to the 230,000 tons above plan previously aimed at.

Judging by the pace set by the originators of the initiative and those who are walking abreast of them, I was told in the association, the counter-addition to the commitments will be fulfilled.

And the miners' competition is spreading. Ten more brigades are preparing to enter it. But each initiative movement requires support. It is laudable that the decree of the Ukrainian SSR Ministry of the Coal Industry and the Presidium of the Ukrainian republican committee of the trade union of coal industry workers stressed engineering support for the initiative, including the improvement of repair and maintenance of mining equipment. But no concrete action has followed upon this. In the mines and in the association there are many complaints of shortages of spare parts, particularly drive wheels and turbo-clutches for the conveyors which bring the coal from the walls. This is why work stoppages are becoming more frequent.

Finally, a word more on one subject. The Gorlovka Machine-Building Plant imeni Kirov cannot deny that the Western Ukrainian miners have cooperated in the recognition of the 1GSh-68 combine. This unit made it possible to institute progressive coal removal, and it now is making it possible to work on the wall with fewer people. At the same time, the plant should give serious thought to how to increase the production of screw conveyors of various sizes to work in seams of various cross section. It is time for them to concern themselves with increasing production of the hydraulic pumps which have become "scarce." This would be of great help to the participants in the competition, who in response to the Letter of the CC CPSU, the USSR Council of Ministers, the AUCCTU and the Komsomol Central Committee have set themselves an important national economic task, that of producing more coal with smaller labor expenditures.

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MINERALS

GEOLOGICAL EXPLORATION ACHIEVEMENTS, GOALS OUTLINED

Moscow RAZVEDKA I OKHRANA NEDR in Russian No 6, 1978 pp 5-9

[Article by V. A. Pervago, board member, USSR Ministry of Geology: "Increasing the Quality of Preparation of Mineral Reserves"; shortened version of report at joint session of board of USSR Ministry of Geology and State Commission on Mineral Resources, 9 March 1978]

[Text] In the document "Main Directions of Development of the USSR National Economy During 1976-1980" adopted by the 25th CPSU Congress the geologists are assigned the task of increasing the economic effectiveness of prospecting and exploration work and the quality of preparation of mineral reserves. The ultimate product of the geological exploration organizations is explored reserves of various types of mineral raw materials, prepared for commercial development. High-quality preparation of reserves for confirmation by GZK [State Commission on Mineral Resources] or TKZ [territorial commissions on mineral resources] requires:

as reliable as possible a determination of the reserves, quantities, forms, dimensions and internal structure of deposits and the distribution of minerals within them;

comprehensive study of the composition of the minerals and identification of all useful components which should be utilized in the commercial development of the deposits;

study of the industrial characteristics of the minerals so as to select the most efficient system of enriching and processing them;

identification of the hydrogeological and engineering geological conditions of the deposits for the purpose of correct planning of mining operations;

designation of sections for production and non-production facilities, a workers' settlement and a tailings dump in such a way that all reserves will be kept available for working;

the development of optimal requirements for the mineral raw materials so as to make possible the most profitable utilization of the explored reserves.

The organizations of the USSR Ministry of Geology annually provide GKZ USSR with 120 to 170 reports giving estimated reserves for the deposits whose exploration has been completed. In 1976-1977, GKZ USSR considered more than 250 reports and confirmed more than 5 billion tons of iron ores, 2.5 billion tons of coal, about 3 billion cubic meters of gas and a significant quantity of nonferrous metals and other minerals. Over two years, the five-year plan for confirmation of bauxite reserves has been 111 percent fulfilled, that for nickel 103 percent fulfilled, that for antimony 78 percent fulfilled, and so on. The quality of the reports presented to GKZ USSR has also improved overall. While in 1969 28.9 percent of the total number of reports considered by GKZ USSR were rated good or excellent and 12.6 percent were not approved, in 1977 GKZ USSR accepted 68 reports as good and 17 as excellent (73.9 percent of the total number) and returned only 3 reports (2.6 percent). Reports estimating coal reserves are being prepared with the highest quality. Some 74 percent of the reports received a high rating and not one was returned. First place goes to the Ukrainian SSR Ministry of Geology, which during three years had high ratings for 10 out of 11 reports. The Polar-Ural Association forwarded two reports on large reserves during this period; one of them received an excellent rating and the other a good rating.

For non-metals, 71 of 104 reports in 1976-1977 (68.3 percent) received a high rating and 9 were accepted as excellent. The Ural TGU [territorial geological administration] is working well, having sent in 8 high-rated reports out of 9, while the Northwest TGU forwarded 13 of 15 with high ratings. The quality of reports estimating subsurface water reserves is fairly high. During the perion in question 73 of 120 reports (60.8 percent) received a high rating. It should be noted that in 1977 30 of 33 reports were entered as author's estimates. We note for comparison that in 1976 there were only 13 such reports out of 34. The highest evaluations were received by the reports of the North Caucasus TGU (13 of 16), GUTsR (10 of 13) and the Hydrogeological Administration of the Kazakh SSR Ministry of Geology (9 of 14). It must be mentioned that high ratings have been received for only a small percentage of reports on ferrous and non-ferrous metals, oil and gas. But there are advanced organizations too: in oil and gas, Glavtyumen'geologiya [Tyumen' Main Administration of Geology] received a good rating on 7 of 9 reports and in ferrous metals the Ukrainian SSR Ministry of Geology did the same on 8 of 11 reports. Thus in recent years the quality of reports has significantly improved, while certain organizations are continuing to issue predominantly high-quality reports: the Uzbek SSR Ministry of Geology, the Geology Administration of the Tadzhik SSR Council of Ministers and others. At the same time, a number of subdivisions have thus far failed to achieve high-quality work. These include, in the RSFSR Ministry of Geology, the Yakut TGU (only 2 of 10 reports rated good and one rated unsatisfactory), and the Orenburg TGU (only one of 5 reports rated good and 2 returned). In the Kazakh SSR Ministry of Geology the lowest-quality reports are those of the Southern Kazakhstan TGU (only one of 7 receiving high marks and 2 returned). The Geological Administration of the Turkmen SSR Council of Ministers received a high

evaluation on only one of 6 reports. Of the total quantity of reports presented to GKZ USSR in 1975-1977, reserves were not confirmed for 17 deposits. Among these were the Saureyskoye lead deposit (Polar-Ural PGO), the Malokhinganskaya group of iron-ore deposits (Far East TGU), the Oseneye copper-pyrite deposit (Orenburg TGU), the Vostochno-Tarkasalinskoye gas pool (Glavtyumen'geologiya) and others. Reports returned by GKZ USSR because of inadequacies in the materials presented were sometimes reconsidered. In 1976-1977 there were six such reports, two of them for iron ores.

There have been cases in which reserves have been confirmed by GKZ USSR at a significantly lower level than proposed. The USSR Ministry of Geology compared data on 379 deposits the reserves in which were approved by GKZ USSR during the last three years. It was determined that in 326 of the reports the confirmed reserves differed from the proposed figures by less than 10 percent, which may be taken as a norm. At the same time, for 53 sites the approved reserves were significantly lower than had been proposed: reserves were decreased on 10 of 42 oil and gas deposits, including a figure of 78 percent for the Yuzhno-Surgutskoye pool, 75 percent for the Zapadno-Krestishchenskoye pool, 61 percent for the Kyrtayel'skoye deposit and so on. For the Strzhanskoye and Guslyakovskoye lead-zinc deposits, 60 and 73 percent respectively of the proposed reserves were confirmed, 63.7 percent for the Uchkoshkonskoye tin deposit and 83 percent for the Akbastau copper deposit. It must be considered a favorable matter that the number of reports for which the proposed reserves were decreased at confirmation has decreased rather sharply. While in 1969 they amounted to 8.5 percent of the proposed reserves, the figure was only 2.3 percent in 1977. Planning for the quantity of reserves to be approved by GKZ USSR is usually based on the presence of unconfirmed reserves included in the balance as of 1 January of the year in question. Their approval is considered in terms of subsequent growth of reserves.

Sometimes the planned quantity of reserves proposed for confirmation sharply decreases, leading to an unfounded overfulfillment of the plan for confirmation of reserves. Large expenditures have been identified in the planning for confirmation of reserves of oil and gas, iron ore, coal and muscovite mica. Thus, comparing 20 reports estimating oil and condensate reserves during 1976 and 1977, in 5 cases the planning for confirmation was significantly lower than the actual figure. The Ukrainian SSR Ministry of Geology is allowing a particularly sharp decrease in the plan for reserves to be confirmed, which indicates significant shortcomings in the planning of this indicator. In a number of cases a decrease in the plan for confirmation of reserves of oil, gas and non-ferrous metals resulted from fear that they might not be fulfilled and the lack of the proper analysis and evaluation of the reserves to be estimated. Sometimes a smaller quantity of reserves than included in the balance is presented for confirmation by GKZ USSR. Thus, the Ukrainian SSR Ministry of Geology in 1976 presented GKZ USSR with a report estimating the reserves of the Pereverzevskoye iron-ore deposit at 227.4 million tons, while the figure in the balance was 242.5 million tons; at the Annovskoye deposit the figures were 2,063 and 2,433 million tons respectively. The Northwest TZU, which is exploring the Sputnik nickel ore deposit on the Kola Peninsula, proposed for confirmation 92

percent of the total quantity of reserves, even while admitting that the figures for operational growth of reserves in the reports were inflated. The same situation developed in the Kazakh SSR Ministry of Geology in the exploration of the Akbastau and Kusmurun copper deposits, for which 76 percent of the reserves were confirmed. In developing the work plans and determining in them the reserves to be confirmed, the territorial and republican geological organizations, as well as SOMP [expansion unknown] and the sectorial administrations of the USSR Ministry of Geology must make a more careful analysis of the status of the reserves.

There are also significant shortcomings in establishing the dates for presentation of reports and draft requirements to GKZ USSR. Thus, according to the 1976-1977 plan, 51 draft requirements were to be presented to GKZ USSR. The USSR Ministry of Geology excluded 10 from the plan and extended the time limit on 6. At the same time, a large number of reports and draft requirements reaching GKZ USSR are outside the plan. During the period in question, of 235 reports which reached GKZ USSR and were considered and 101 draft requirements, 24 and 39 respectively were outside the plan. The majority of these reports and draft requirements were from the ministries of geology of the RSFSR, the Kazakh SSR and the Ukrainian SSR and were largely for non-ore materials and hydrogeology, indicating poor accounting of the sites to be explored and the completion of work on them. Many reports still are sent to GKZ USSR toward the end of the year: in 1976-1977, 56 of 235 reports arrived in the fourth quarter. The accumulation of a large number of reports at the end of the year leads to difficulties in confirming them. As a result of consideration of reports by GKZ USSR, certain characteristic shortcomings which are being allowed in the exploration of solid mineral deposits were identified.

1. Drilling of a significant number of boreholes outside the limits of the commercial ore formation. At the Ozernoye tin placer, explored by the Yakut TGU, the data for only 152 of 603 workings and 135 of 16,570 samples taken were used in estimating the reserves. At the Kayraktinskoye nickel-silicate ore deposit only 212 boreholes of 1,235 drilled by the Orenburg TGU struck an ore zone with a commercial mineral content. The inefficient placement of boreholes not only lowers the quality of the exploration, slows it down and makes the work more expensive, but also lowers economic effectiveness.

2. The exploration of complex deposits by means of mine workings driven into the country rock with crosscuts into the ore body. In this process the ore body is struck by individual crosscuts and the degree of intermittency and density of the mineralization is not traced, which frequently leads to errors in interpretation of exploration data. The content of useful components in the ore is overestimated. For example, at the Katekhskoye lead-zinc deposit, only 416 of 8,600 meters of underground drifts were cut directly into the ore bodies. The situation is the same at the Yakhtonskoye tungsten deposit and others. In a number of deposits the mineralization is more variable along the dip than along the strike of the ore body, necessitating its study by ascending workings. However, these workings are not driven in a number of cases. In the Katekhskoye deposit only two rising workings with a total length of 55 meters were cut.

3. Undervaluation of drilling data in estimation of reserves. In a number of deposits with complex geological structure no account was taken of the data from any of the boreholes in estimating reserves. At the same time, their utilization in reserve estimation is extremely important in increasing the reliability of the estimates and decreasing the time and expenditures for exploration.

4. Low quality of drilling and resultant poor quality of cores, for example in the Yubileynoye copper deposit (Bashkir TGU), the Pereverzevskoye iron-ore deposit (Ukrainain SSR Ministry of Geology) and a number of others. Incorrect allowances for selective abrasion of the cores has led to overestimates of the mineral content (in core samples of the iron deposits in sectors of the Krivoy Rog Basin Ore Administration) or to underestimates (Sorskoye molybdenum deposit and others). Materials indicating the reliability of the drilling data are frequently absent. At the Katekhskoye deposit only a comparison of the average content of the main components for 22 meters of ascending workings and 7 meters of workings connected with them was made.

5. A perfunctory approach to the choice of an exploratory network, without allowance for the geological structure of individual parts of the deposit, and a lack of substantiation when choosing a density. Significant deviation of wells at depth leads to thinning of the exploration network, for example in the exploration of the eastern part of the Gayskoye copper-pyrite deposit (Orenburg TGU) and the Sputnik nickel deposit (Northwest TGU).

6. Insufficient quantities of geophysical research, particularly borehole geophysics, and the study of the morphology of the minerals.

7. Poor quality of primary geological documentation and descriptions of core samples and workings, making it impossible to identify the bedding characteristics and structure of ore bodies, their relationship with the country rock and so on (in the Katekhskoye, Sayreyskoye and other polymetallic deposits). Frequently the documentation is entrusted to unqualified persons and it is not compared or insufficiently compared with the actual conditions by experienced geologists. Sampling of minerals is still not being done effectively and channel samples are not being checked against bulk and industrial samples. Discrepancies have been noticed between the initial documentation and the summary charts, and bedding elements and the relationship between ores and country rock accordingly to cores and workings is being ignored in the construction of sections and layouts.

8. Incorrect delimiting of estimation blocks and incorrect allowance for the influence of hurricane samples in the laboratory processing of geological materials and the drawing up of estimates.

In oil and gas exploration work, wells are frequently not soundly located owing to failure to prepare the structures for deep drilling. This leads to the drilling of a large number of wells outside the limits of commercial oil and gas content and to increased exploration time and higher costs. From 30 to 75 percent of wells were drilled beyond the limits of oil and gas content at the Yefremo-Zykovskoye and Dolgovo-Tananykskoye (Orenburg TGU), Kozmachskoye, Novotroitskoye, Lobachevskoye, Mashevskoye, Stynavskoye, Bogdanovskoye and Monsatyrishchenskoye

pools (trusts of the Ukrainian SSR Ministry of Geology). There is not enough sampling and its quality is too low; productive deposits are studied at large intervals which include formations with different characteristics. There is limited use of methods of intensifying flow. Core material is poorly studied as a result of inadequate and uneven taking of core samples from productive horizons over an area and in section and of unsatisfactory investigation of the samples. At the Kozmachskoye gas pool and the Kezskoye oil pool samples were taken from only 3 percent of the main productive horizons. The consequence of inadequate study of the samples is poor understanding of the collector characteristics of the productive deposits and a poor foundation for the parameters used in estimating reserves.

Additional matters affecting the quality of estimates are: the absence of the correct relationship between the amount of underground working and the drilling of boreholes for various minerals and types of deposit. Frequently the number of underground workings is increased and borehole data are excluded from the estimates. The requirements for quantity and level of detail of industrial studies are imprecise. It frequently happens that according to the requirements of sectorial ministries unnecessary semi-commercial and plant processing studies are conducted on minerals whose processing is not labor intensive and which are similar to other minerals for which processes have been developed. This makes exploration more expensive and more time-consuming.

It can be seen from the above that even though the situation with regard to preparation of mineral reserves has improved considerably in recent years, much work must still be done to remove a number of inadequacies. This work must be carried on at all levels of the geological service, primarily in the teams and expedition groups and in the territorial and republican geological organizations. The leaders of geological organizations must step up their monitoring of the direction and quality of geological work and take steps to improve the comprehensive study of deposits. It is beneficial to employ in the methodological leadership of operations and the preparation of reports on major and complex deposits the most skilled specialists of the geological organizations and the scientific research institutes in order to assure timely evaluation of the correctness of the method of detailed exploration that has been adopted and to improve effectiveness of geological work and the reliability of the reserves. The scientific and technical councils of the geological administrations and trusts must discuss and approve in advance the reports on the most important sites which are sent to GKZ USSR for confirmation. The practice of submitting preliminary reports on such deposits to GKZ USSR should be estensively used. All cases of non-confirmation or significant reduction of the quantity of explored reserves by GKZ USSR should be considered by the scientific and technical services of the organizations so as to develop measures to prevent similar occurrences. Participation of the leading workers in the administrations, trusts and associations and responsible representatives of republican ministries in the discussion of reports estimating reserves should be arranged. The central apparatus of the USSR Ministry of Geology, and particularly the sectorial administrations, should continue to have a major part in increasing the quality of geological exploration and preparation of reserves.

The Central Commission on Mineral Reserves of the USSR Ministry of Geology must be more demanding regarding the quality of materials which form the basis of operational increases of reserves. It is proposed that the consideration of operational increases of reserves in terms of the largest, most important and most complex deposits at plenary sessions of the TsKZ [Central Commission on Mineral Reserves] be overhauled and made more efficient, with preliminary analysis of the estimates by experienced specialists. In order to assure the comprehensive study of deposits it will be beneficial to take steps to develop and incorporate into production laboratories methods for the analysis of byproduct components and dispersed elements. Laboratories with specialized apparatus and equipment for industrial study of larger samples must be organized, a larger network of them developed and the number of specialized laboratories for umpire and control analysis, particularly for rare metals and dispersed elements, increased.

During the remaining years of the five-year plan GKZ USSR is required to confirm a significant quantity of reserves: more than 1 billion tons of iron ores, 25 million tons of manganese ores, more than 4 billion cubic meters of gas, 11 billion tons of coal, 106 million tons of phosphorus pentoxide, 72 percent of the five-year target for oil, 68 percent of the target for copper, 90 percent for lead, 94 percent for zinc, 57 percent for tin and 100 percent for tungsten, mercury and other minerals. The accomplishment of these tasks requires intense work on the part of many geological organizations.

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MINERALS

NEED FOR NEW GEOLOGICAL EXPLORATION EQUIPMENT ACUTE

Moscow PRAVDA in Russian 1 Jun 78 p 3

[Article by Yu. Bugakov, Chief, Administration of New Equipment and Geological Exploration Equipment, USSR Ministry of Geology, winner of USSR State Prize: "The Diamond Drill Has Not Become Blunt"]

[Text] Geology is not only a persistent search, but also the profound and comprehensive exploration of mineral reserves that have already been found. In this area the effectiveness of work depends to a great degree on the quality of equipment available. The amount of drilling is increasing every year and it is becoming more difficult to carry on exploration: we have to penerate ever deeper into the solid earth. Until relatively recently, boreholes were being drilled mainly with steel or iron shot. The discovery of domestic diamond deposits has enabled us to successfully utilize a new tool and to increase drilling speed.

The scientific research and design organizations have proposed a number of new types of drilling equipment. These include especially devices with removable core-catchers which have made it possible to increase drilling speed by a factor of 1.5 to 2. A considerable effect is coming from the utilization of new steel and light-alloy casings. The new technology has enabled the advanced brigades of the Kiyevgeologiya [Kiev Geological] Trust to attain a rig speed greater than 4 times the average for the USSR Ministry of Geology. Drilling with hydraulic transport of cores promises a great deal. In this case the speed is reaching 6,000 meters per unit per month, several times greater than with any other method. The average indicators for the sector, however, are about half what they could be. What is the problem? Has the diamond drill become blunt? No.

The main reason is that all the innovations were fabricated in shops and experimental departments of institutes and design bureaus in the ministry. These are extremely poorly equipped. The USSR ministries of Chemical and Petroleum Machine Building, Ferrous Metallurgy, the Machine Building and Tool Making Industry and Heavy, Power and Transport Machine Building have had to be asked to supply the required equipment. The amount of geological exploration is

increasing steadily, but new plant capacities for the production of equipment for the geologists are practically not increasing at all. What will be the consequence? The designers have developed new, modern drill casing prototypes. The Ministry of Ferrous Metallurgy was assigned a date for delivery: 1970. Five years ago Minister I. P. Kazanets stated that the pipes would be produced after reconstruction of the shops at the Nikopol and Pervoural'sk plants were completed. At the request of the geologists, Gosplan USSR has frequently reviewed this question and has established new delivery dates, but to this day the situation has not changed. Even what we are getting is far from being of high quality. There are all-union state standards for the manufacture of geological exploration casings, but the suppliers are not observing them.

The geologists have a great need for drilling tools and equipment. The production of these has been assigned to the Ministry of Chemical and Petroleum Machine Building. This ministry is the main supplier of rigs for core drilling. But we are receiving neither type of equipment in sufficient quantities. The pleas of lack of capacity and of upcoming reconstruction of steel enterprises are already standard fare in our relationship with the machine builders. And the result is that the equipment they are preparing to manufacture is becoming obsolescent.

Drilling rigs cannot be used effectively without tools of the most modern design. Such tools have been developed. It has been shown in practice that if they are used on units currently being produced, labor productivity can be increased by a factor of 1.5 to 2. But neither the Ministry of Chemical and Petroleum Machine Building nor Gosplan USSR can tell us precisely when and where and how much of this equipment, which is necessary for geological research, will be produced.

We once fabricated an experimental lot of a new diamond tool. Series production was assigned to the Kabardino-Balkarskiy plant of the Ministry of the Machine Building and Tool Making Industry. And what happened? The enterprise has not filled even one of our orders. It turned out not to be ready to produce the innovation.

The geologists are doing a good deal to find points of contact with the machine builders. But here, for example, is how our business relationship with the Ministry of Heavy, Power and Transportation Machine Building has developed. We attempted to organize effective intersectorial communications and ultimately to get the necessary products which we ordered. But one of our last attempts led to precisely the reverse result: the ministry appealed to Gosplan USSR to exempt it from the production of geological exploration equipment, assigning its production to the USSR Ministry of Geology. And the director of the Novocherkassk plant, with whom we had had rather firm ties, went even farther: pleading an upcoming reconstruction, he informed the consumers that deliveries of drilling equipment would cease in 1980. We must state bluntly that today all of our geological subdivisions are experiencing a major need for modern equipment.

In the next 10-12 years the amount of core drilling will increase by about half, and accordingly it will be necessary to increase significantly the output of geological exploration equipment. In this connection it is extremely important to develop a mechanism for the planning of equipment production for geologists in the future. Currently Gosplan USSR is planning its production only through individual assignments. Our product is swallowed up in one line of the products list: "Tools for oilfield equipment." The result is that during the last 10 years capacities for production of geological exploration tools in the Ministry of Chemical and Petroleum Machine Building have not increased at all.

It is wrong to burden Gosplan USSR with concerns involving a long list of tools. This is purely a sectorial matter. But our orders have been sent to enterprises in several industries and none of them has been assigned the administrative function vis-a-vis the others. This means that a decision must be made: production of specialized equipment, including such types as ours, must be concentrated in a few hands.

This is the viewpoint from which, in our view, the work of organizations involved in manufacturing equipment for geologists must be reviewed. Today most exploration equipment is produced in the enterprises of other sectors according to documentation developed in our institutes. It is clear that in a case where the equipment is of narrowly sectorial application it would be reasonable to concentrate all the efforts involved in its development in the hands of one department, in this case the USSR Ministry of Geology.

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MINERALS

VOLGOGRAD BISCHOFITE UTILIZATION DELAY EXAMINED

Moscow PRAVDA in Russian 23 Aug 78 p 3

[Article by PRAVDA correspondent G. Ivanov: "A Supply Under Lock and Key"]

[Text] I have been following the fate of the Volgograd deposits of magnesium-chlorine salts--bischofite--for more years than one. The deposits are extremely rich and nothing similar has been found anywhere in the world. The processing of this outstanding raw material could bring immense benefits to the national economy.

Current technical progress, for example, has resulted in a great need for metals such as magnesium. Dozens of factories are already in operation abroad extracting it from sea water. They produce about half of the world output of this metal (other than the USSR). The new process has turned out to be so profitable that in a number of countries enterprises producing magnesium by the traditional method have closed.

At the same time, what these plants obtain from the sea water is not magnesium, but its compounds with chlorine--bischofite, in fact. From this the metal and other products are then produced. On the lower Volga nature herself has performed the function of these plants, storing up hundreds of billions of tons of raw material. Thus we can produce the cheapest magnesium in the world and expand the scope of its utilization.

However, almost 20 years have already passed since the geologists discovered the deposit. And why has it not yet been "unsealed"? I have frequently addressed this question to various organizations but have never received a satisfactory answer. Two years ago, for example, the Ministry of the Chemical Industry told me that everything was proceeding normally and that it was planned to drill an experimental borehole during the Tenth Five-Year Plan. Things may be normal, but there are no boreholes yet.

Gosplan USSR promised an answer after it put together the technical and economic substantiation for the development of the deposits. I am still waiting for my answer.

V. Yakovlev, Kandidat of Geological and Mineralogical Sciences

Just what is holding up the development of this rich deposit?

PRAVDA has written twice of the bischofite in Volgograd. The first time, on 20 June 1974, the article "Salt From a Permian Sea" said that the problem should be solved comprehensively and that an intersectorial organization should be designated immediately to carry on operations without being confined by the interests of an individual department. As a practical step, it was proposed to set up an experimental factory.

In the official reports sent to the editors, this proposal was not supported. It was declared that it would be premature and even inexpedient to develop the deposits, that it would be unprofitable, or even impossible, to obtain such products from bischofite. The authors of the report were not embarrassed by the fact that their assertions had long since been refuted by worldwide practice. In a similar spirit, a letter of Deputy Minister of the Chemical Industry A. Novikov maintained that "it would be premature to develop them."

This is all ancient history. Is it worth bringing up again? Yes, unfortunately. It reflects a position of the ministry from which it apparently has no intention of departing. It is true that the question of "prematureness" is not raised now. The reason is that back in 1974, shortly after the newspaper article, the Ministry of Chemistry, which is in charge of extraction and processing of mineral salts, and other departments were assigned the preparation of technical and economic substantiation (TEO) for the development of the Volgograd deposit. Next this problem was included as a special assignment in one of the 200 comprehensive scientific and technical programs of the Tenth Five-Year Plan. The assignment is: "Develop an effective industrial process for comprehensive processing of chlorine-magnesium raw material based on the Volgograd bischofite deposit." The Ministry of the Chemical Industry was charged with commissioning in 1977 a pilot commercial desalination operation and this year an experimental complex for the development of a process for obtaining a number of products including pure magnesium oxide.

It was, of course, not obligatory that the chemists should also fall in love with bischofite, since it has a limited range of application in the chemical industry. But the products of its processing are quite necessary to many other sectors. And here it was quite necessary that it change its position: a state plan--a law which could not be broken--had been adopted; but even then the Ministry of the Chemical Industry stuck to its attitude toward the problem.

When the ministry began on the technical and economic substantiation it also started a different sort of procrastination and delay. As a result the task dragged on, and even the preliminary document lay in the ministry for half a year waiting for coordination. Neither were contacts with other intererested organizations organized as they should have been, and there were many "blank spaces" in the substantiation which had to be hurriedly filled in even after the document had been sent up for state examination.

The article "Under the Bureaucratic Flag," published in PRAVDA in 12 June 1977, discussed the delaying tactics that were being used by the ministry. A year has passed, but during that time the chemical workers have not come one step closer to the deposit in Volgograd. It is true that more than half a year ago an examining commission of Gosplan USSR supported the conclusion of the authors of the technical and economic substantiation that it would be profitable to make comprehensive use of the bischofite. This was important in itself: what the deposit could give the country was finally determined. But its practical development is still nonexistent.

The most eloquent indication of the ministry's position is its negative attitude toward the experimental complex, if a stubborn unwillingness to fulfill the assignments of the state plan can be called a "position." The importance of studies under experimental production conditions is unquestioned: it is a new and rather complex activity. And the Gosplan experts proposed, in their recommendations, to speed up these studies: they offer the possibility of producing by a relatively inexpensive process extremely high-quality products. Using bischofite it would be possible to obtain, for example, magnesium oxide of 99 percent or higher purity, which is impossible with the traditional raw materials. This product is not produced in this country; it is extremely scarce and highly necessary in non-ferrous metallurgy. It is used in the production of refractories which are used in the smelting of high-quality steels and in non-blast furnace and other advanced metallurgical processes. Thus it has become necessary to base on the Volgograd deposit a plant for the production of pure magnesium oxide, and accordingly the importance of the pilot work has already increased considerably.

But the Ministry of the Chemical Industry still has not begun the construction of the experimental complex. It seems that a five-year plan assignment is not law for it. Perhaps unforeseen difficulties have arisen in its path? No such thing. Different sorts of obstacles have arisen.

It is impossible to being work, to undertake the financing, to order the equipment or to make an agreement with a contractor without a ministry order. All of last year was spent in preparing and coordinating this order. The year ended, the order remained unsigned, and the command was not issued. A new year has come, and with it another round of coordination. The order has been making the rounds for another eight months. Along with it a working technical plan for the pilot commercial operation, developed by the Scientific Research Institute of Halurgy, is also making its way through the offices. Since last March the ministry has not found the time even to discuss it. What is this if not an

example of ministerial red tape? There is no other word for such a "style" of considering problems.

Instead of precise and timely fulfillment of its share of the obligations in the intersectorial program, the responsible ministry personnel are seeking pretexts to shirk them. They declare that the experimental complex is not at all necessary; then suddenly they declare that the bischofite plant will be harmful: it is better, apparently, to delay longer. These declarations are baseless and easy to refute. But other people simple-mindedly believe such improvisations: after all, knowledgeable people in authority have given their opinion. Is this not why the specialists who visited Volgograd to get the lay of the land for the construction of the magnesium oxide plant met with incomprehension on the oblast level?

Another recent occurrence. A relatively small quantity of bischofite brine is needed by the forest industry. Who will deliver it? The chemists calculated that they would gain next to nothing for the brine, a few tens of thousands of rubles a year, not worth the trouble. Accordingly they refused. The deputy chairman of the USSR State Committee for the Forest Industry, N. Botolov, made a special visit to Volgograd, hoping for support from the local organs in arranging the deliveries. He got no support. And the foresters need the bischofite: they might just as well see about extracting it themselves. It this the way state operations should go? There are hunderds of such consumers. Does each one have to build its own desalination plant?

Besides, the participation of the local organizations is necessary to solve the problem. The Volgograd party obkom used to submit frequent proposals to speed up the development of the deposits. But this was all it did. The bischofite question was never the subject of serious discussion. Are there any grounds o for surprise that specialists from scientific organizations in Moscow, Leningrad and Gor'kiy are working on the many complex problems of processing this raw material on their own initiative, but no organizations in Volgograd?

All these facts can be summed up in one word: disorganization. This is both the cause and the consequence: disorganization reproduces and multiplies itself. And inseparable from it is the lack of a sense of responsibility.

Why do Gosplan USSR and the USSR State Committee on Science and Technology stand for this? All requests from the undisciplined executants boil down to telephone calls or at most letter reminders. But success is unthinkable for any special intersectorial program if the activity is not run comprehensively, according to precise schedules and on the basis of responsibility for their work areas on the part of all participants. But it is precisely these "trappings" that are lacking in the preparations for development of the bischofite deposits. What is required is organizational measures which will help to unite the scientific and technical forces of the relevant ministries and departments.

Half of the five-year plan is already gone. Can we resign ourselves any longer to having one department continue to treat an important assignment of the five-year plan as a burdensome chore while others must wait, or go into action, frequently without financing, outside the plan--but at least with enthusiasm?

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MINERALS

EXPANSION OF ORE MINING ENTERPRISES IN KURSK ANOMALY

Moscow IZVESTIYA in Russian 28 Jun 78 p 2

[Article by V. Lositskiy, Deputy Director, Institute for Problems of the Kursk Magnetic Anomaly imeni L. D. Shevyakov, and A. Trebukov, department manager of the institute: "Toward the Riches of the Kursk Anomaly"]

[Text] Enterprises of the mining and ore-dressing industry are being started and expanded at a rapid pace in the area of the Kursk Magnetic Anomaly (KMA). The day is already in sight when the Skol'skiy Electrometallurgical Combine, the first in the country, will be putting out a finished product. The reserves of rich ores and iron-bearing quartzites in the KMA amount to tens of billions of tons and have no equal anywhere in the world.

The collective of the Scientific Research Institute of Problems of the KMA is helping the practical workers not only to recover all of this inestimable treasure, but to recover it with minimal losses. At the suggestion of the institute's staff members, old equipment is rapidly being replaced by the most modern kinds in the enterprises of the Kursk Anomaly. Implementation of schemes for development of railway transport and placement of powerful equipment in the opencuts of ore enrichment combines is being completed. This made it possible to realize in the previous five-year plan alone an economic effect of more than a million rubles.

The institute has developed a high-output hydromechanical stripping process. Thanks to hydromechanization, the Yuzhno-Lebedinskiy working was constructed in 3 fewer months than expected. Productive capacities are rapidly being mastered there, and the cost of stripping work is the cheapest anywhere. In the Ninth Five-Year Plan alone 23 million rubles was saved by the new process.

A major direction of technical progress at the KMA is the development of powerful and extra-powerful ore-enrichment enterprises. Scientists have demonstrated the effectiveness of developing such enterpises, with a total product output which will reach about 150 million iron-bearing quartzites a year [as published] on the basis of the Lebedinskoye and Stoylenskoye deposits.

Modern equipment is in operation in the existing opencuts of the Anomaly. It is making the development of the deposits highly profitable. Let us add that continuous-process equipment of special design is being mastered at the Anomaly. Rotary-bucket complexes which handle 5-8 million cubic meters a year are making possible the highest labor productivity in the sector. In the future, continuous-process complexes using rotary and multi-bucket excavators will be used extensively at the Stoylenskiy, Chernyakskiy and other opencuts.

Combined transport for the hauling of ores and gangue, including truck-rail, truck-conveyor and truck-hydraulic forms, is expanding greatly. As a result, more ore will be recovered and production costs on its recovery will decrease.

The main task which our collective is setting itself is that of developing equipment and processes for opencut and underground recovery of iron ores--equipment and processes which will be profitable to operate in the next century. To leave future generations the most modern equipment is the aim perceived by the scientists.

The future will see the Yakovlevskaya mine, now under construction, where the iron ore will be extracted by underground operations. It will make possible full utilization of the underground riches, protection of the environment (the water regime will remain untouched) and safety in mining operations. The researchers are working to transform the underground mine into a highly mechanized and automated enterprise. An enrichment combine for extraction and processing of quartzites using the giant-chamber method will be developed on the base of the mine imeni Gubkin. There, high-output drilling units will remove the ore. Transport of the ore through haulage levels and shafts to the bunkers of the enrichment factories will be automated. The enrichment wastes--i tailings--will be removed to underground chambers, and there will simple by no tailings dump.

Since the basin of the Kursk Magnetic Anomaly is located in a thickly settled area, maximum preservation and utilization of the fertile chernozem ground layer and protection of the air basin is extremely important. A number of institutions of higher education, jointly with scientific research institutes, have developed high-output methods for mining, agricultural and forest recultivation of lands disturbed by mining operations which will fully compensate the damage done to agriculture, and in a number of cases will even make possible improvement of the landscape.

The mining enterprises being built on the KMA will continue operating into the 21st century. This entails many obligations. The economic and engineering level of these enterprises is being determined even now, and we must develop well-founded forecasts of the future development of the basin. Rational placement and development procedures for mining production and determination of the optimal size of enterprises are particularly important.

Our institute conducts and coordinates technical policy at the KMA. This is an honorable task, but also a responsibility. This is why systematic long-term

programs of comprehensive study of the development of the basin and continuing scientific projects aimed at improving the efficiency of existing enterprises are taking an increasingly central position in the activity of our institute.

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IMPROVING TECHNOLOGY OF OPEN-PIT MINING

Moscow GORNYY ZHURNAL in Russian No 8 1978 pp 28-30

[Article by S. Ya. Arsen'yev, Candidate of Technical Sciences; V. P. Linev and S. B. Rubinshteyn, mining engineers; A. F. Bogachev, Candidate of Technical Sciences (Giproruda): "Improving Equipment and Technology of Open-Pit Iron Ore Mining"]

[Text] The Giproruda Institute, jointly with this branch's mining design institutes, have completed projects on the problem of development of pit-mining equipment and technology at open-pit iron, flux, manganese and chromite mines.

Future development of open-pit mining of ore bodies will be characterized by an increase in mine capacity to move ore and rock and increasing complexity of mining conditions.

In the area of drilling operations, the present trend toward increase in diameter of blast holes will continue in the immediate future -- the bulk of the work in drilling blast holes will be performed by milling-cutter drilling machines. SBSh-320 drilling machines are to be employed at large pit operations of mining and ore beneficiation combines in the Ukraine, as well as the open-pit mines of the Kovdorskiy, Kostomukshskiy, and Kacharskiy mining and beneficiation combines.

Presently on the drawing board is the SBSh-400 unit, which will be employed at large pit mines with highly-resistant rock and ores of fine-block structure and good crushability (mines of the Krivbass). At other open-pit mines these units can be used in drilling the first row of shot holes for improving working of the base of high benches. We shall begin adoption of combined-drilling units (thermal-milling cutter, percussion-milling and vibro-milling). Newly-designed drilling machines will be distinguished by a high degree of mechnization and automation and will make it possible substantially to reduce time for performing auxiliary operations. This will additionally increase drilling machine productivity an average of 20%, which will amount to 90-120 m per shift. The SBSh-160 milling-cutter drill is being developed for [zaotkoska] benches.

Expected Distribution of Milling-Cutter Drill Inventory (%)
By Shot-Hole Drilling Diameter

	1975	Future
200 mm	26	13
250 mm	73	50
320 mm	1	32
400 mm	—	5

Total mechanization of all processes and operations pertaining to receiving, storing, and utilization of commercially-manufactured granulated explosives is a promising development. All handling operations pertaining to receiving, storing and issuing from base storage facilities explosives packaged in paper sacks will be performed by electric lift trucks in package form.

Charging of shotholes will be performed by MZ-4 and MZ-8 charging machines. At large open-pit mines charging machines will be loaded either at mechanized explosives handling stations or (at enterprises with annual explosives consumption from 1,000 to 10,000 tons) from the MPR-30 unpackaging unit. At small open-pit operations with an annual explosives consumption of less than 1,000 tons, transfer of explosives from storage to blast site will be handled by boxbed truck, and opening of explosives sacks with the aid of a sack-opening unit will be performed immediately prior to charging the shothole. ZS-1B and ZS-2 tamping machines will be employed for tamping shotholes.

At the second stage of adoption of total mechanization of blasting operations, granulated explosives will be supplied to mining enterprises in MK-1.5 1-ton soft containers, which will eliminate the need for stacking and unstacking equipment, sack-opening units, and will also make it possible to simplify operations of receiving, storing and loading explosives into charging units.

Simple explosives of the igdanite and ifzanite type will be extensively employed at open-pit iron mines. Toward this end it is necessary to develop high-productivity systems of machinery and equipment for the manufacture and use of these types of explosives, as well as to determine for each open-pit operation expedient volumes of rock to be blasted with these explosives.

The principal trends in changing the structure of the excavator fleet in the future will be an increase in excavator average output capacity by increasing the number of EKG-8I excavators, as well as EKG-125 excavators at the largest open-pit operations. Calculations have shown that capital investment and operating costs just for excavation, employing EKG-12.5, EKG-6, ZUS, and EKG-20 excavators are higher than with employment of EKG-8I excavators. This is a consequence of the fact that the cost of new loading equipment runs substantially ahead of increase in productivity of this equipment (see table).

Comparative Figures on Capital Outlays and Productivity of New Excavators

Excavator	Unit Cost		Per-Shift Productivity on Rock	
	Thousand Rubles	Percentage of Cost of EKG-8I	M^3	Percentage of Productivity of EKG-8I
EKG-8I	289	100	2000	100
EKG-12.5	540	187	2700	135
EKG-6, ZUS	361	125	1550	78
EKG-20	1200	415	4000	200

When excavating rock with larger excavators, additional savings in transport can be obtained by reducing loading time. Therefore it is economically expedient to employ EKG-12.5 in place of EKG-8I excavators in the open-pit operations of the Kovdorskiy, Kacharskiy, Kostomukshskiy, Kachkanarskiy, Stoylenskiy, and Lebedinskiy combines, at the Sarbayskiy open-pit operation of the SS [expansion unknown] Mining and Beneficiation Combine, and at the Pervomayskiy Northern Mining and Beneficiation Combine.

With utilization of EKG-12.5 in place of EKG-8I excavators, it becomes possible at a number of open-pit operations to reduce current annual rock removal volumes with unchanged ore excavation productivity by increasing the height of working benches. This applies first and foremost to the Kovdorskiy and Kacharskiy Mining and Beneficiation combines, Open-Pit Mine No 1 of the Ts [expansion unknown] Mining and Beneficiation Combine, etc. For example, an increase in bench height at the Kovdorskiy open-pit operation from 12 to 18 meters makes it possible to reduce the mine's excavation output from 70 million to 63 million tons. An increase of bench height to 15 meters in loose rock and to 18 meters on intermediate rock at the Kacharskiy open-pit operation will lead to a decrease in volume of excavation by 13 million m^3 and a substantial reduction in volume of road operations.

With current prices on excavating equipment, employment of EKG-6, ZUS and EKG-20 excavators in place of EKG-12.5 is uneconomic. For example, employment of EKG-6 and ZUS excavators in place of the EKG-12.5 at the Sarbayskiy open-pit operation for loading rock requires additional capital spending of 3.69 million rubles and a 1.03 million ruble increase in annual operating costs. As a result of this, economic effect will diminish by 1.5 million rubles per year. Employment of EKG-12.5 excavators in this open-pit operation will for all practical purposes not worsen the conditions of working high benches, since the EKG-12.5 excavator has an effective scooping height of only 2 meters less than that of the EKG-6 and ZUS.

When replacing EKG-6 and ZUS excavators with EKG-12.5 excavators, in order to provide safe bench working conditions there arises the problem of developing additional devices and equipment (scrapers, drags, etc), which would make it possible to reduce collapse height and work a higher bench

with excavators with conventional working parameters. These same excavators could safely work benches with dividing rock face collapse into subbenches.

Calculations have shown that utilization of the EKG-20 in place of the EKG-12.5 excavator in the Kacharskiy open-pit operation will require additional capital spending in the amount of 2.7 million rubles and will lead to an increase in operating costs by 0.6 million rubles per year, as a result of which economic effect may decline by more than 1 million rubles per year. Employment of these excavators at the Lebedinskiy Mine will require additional capital spending in the amount of 3.3 million rubles, with a decrease in economic effect of more than 0.5 million rules per year.

EG-12 hydraulic excavators will be utilized at open-pit iron mines. It is more advisable to utilize these excavators at mines located in warm-climate regions.

Expected Ratio of Excavator Types in Total Fleet, %

	1975	Future
EKG-4, 6 and EKG-4	65	20
EKG-6, ZUS	2	2
EKG-8I	33	57
EKG-12.5 and EG-12	—	21

The average future excavator fleet bucket capacity will be 7.4-8.2 m^3.

The main trend in development of open-pit mine transport is further adoption of combined modes of transporting rock and ore from the deep levels and an increase in the unit capacity of transport vehicles.

Expected Distribution of Rock and Ore Transport Volumes (% by Weight) at Open-Pit Iron Mines, Broken Down by Types of Transportation

	1975	Future
Rail	40.5	33.6
Truck	25.2	12.6
Conveyer	4.0	7.9
Combined	26.8	45.9
Of that:		
Truck-Rail	25.6	24.3
truck-skip-rail	—	3.0
truck-skip-truck	—	1.6
truck-conveyer	1.2	3.9
truck-conveyer-rail	—	10.2
rail-conveyer	—	1.5
rail-conveyer-rail	—	1.2
Other	3.5	—

As is evident from the above figures, rail transport will continue to occupy a dominant position at open-pit iron mines. The most commonly-employed equipment at large open-pit mines will be 240- and 360 ton DC (PE-4 and PE-2M) and AC (OPE-2) traction units, as well as traction units with self-contained power supplies (OPE-1A and OPE1B), consisting of a control electric locomotive, a motor dump car, and a 1500-2000 horsepower diesel-electric unit.

Employment of powerful locomotive units will make it possible to increase track grades to 60-80% and to increase consist payload to 1,000-1,800 tons. Locomotive productivity will increase by 30-50%, loading equipment productivity by 15-20%, while transport costs will decline by 20-30%. In order to employ grades of the above steepness it is necessary to design and build a reliable locomotive and dump car brake system, as well as equipment for mechanizing track operations and overhead-wire mounting equipment capable of operating efficiently under such conditions.

Future development of the rail car fleet at large open-pit mines will involve an increase in the load capacity of dump cars to 180-240 tons and employment of new dump car designs in connection with an increase in excavator bucket capacity and the necessity of structurally strengthening cars to resist impact loads.

In the future industry will be series-producing dump trucks of 80, 110 tons and larger. In evaluating the effectiveness of utilization of large-capacity dump trucks at large open-pit iron mines, one must bear in mind that construction of these enterprises involved planning the utilization of 80-ton and in many cases 120-ton dump trucks. With utilization of 180 and 250-ton dump trucks at existing open-pit operations, considerable enterprise renovation will be necessary -- widening and increasing the load capacity of haul roads, renovation of garage-maintenance facilities, etc, which at the overwhelming majority of enterprises is technically difficult and economically infeasible. In certain instances these large dump trucks can be used only in building large new open-pit mines.

Technical-economic calculations have established the economic effectiveness of replacing 75-ton BelAZ-549 trucks, as specified in the plans, by 110-ton dump trucks at the open-pit mines of the Kostomukshskiy, Kacharskiy, Sarbayskiy, Inguletskiy, Northern (Pervomayskiy Mine), Central Krivoy Rog (Mine No 1) and Novo-Krivorozhskiy (Mines No 2-bis and No 3) Mining and Beneficiation combines. Overall savings from employment of 110-120 ton dump trucks at these enterprises will total more than 13 million rubles per year.

Conveyer transfer will experience further development. While transfer of loose rock by conveyer from the blasting face directly to the dump will, as in the past, be performed only at the Mikhaylovskiy and Stoylenskiy Mining and Beneficiation combines, as well as at manganese ore enterprises, utilization of conveyer transport in cyclic-line process systems in working deep levels at open-pit mines, in combination with wheeled transport, is specified at 10 very large iron-ore combines. Type RTL-5000 and RTL-6000 belt conveyers with a belt width of 1,600-2,000 mm will be the predominant types.

In the future totally new types of transport will be used at large iron mining enterprises for transporting rock and ore from deep levels -- inclined skip hoists and deflecting-plate conveyer frames.

Skip hoists with a skip capacity of 80-120 tons wills be utilized in the near future in working deep levels at open-pit mines the upper levels of which are employing rail transport in the following arrangement: rock and ore is carried from the blasting face by dump truck to a lower transfer station, where it is transferred to a skip, which is hoisted to an upper transfer station and loaded into rail cars. With the employment of special movable bunker sections at the upper transfer station, it will be possible to eliminate the use of bulky storage arrangements and reduce rail consist loading time to 3-5 minutes.

Conveyer trains possess a number of unquestioned advantages over other modes of transport, the most important of which are capability to transport rock without preliminary crushing with steep route gradients (up to 20°) and tight turn radius (to 25 m), as well as high output capacity per line -- up to 40 million tons of rock per year.

The area of employment of plate conveyers is limited to the transfer of barren rock from deep levels to dumps. Employment of this mode of transport for delivering ore to the crushing and beneficiation mill is economically infeasible, since in off-loading large-piece material (each piece may weigh as much as 3-5 tons) into the hoppers, conveyer speed should be reduced to 1 m/s (at a mainline speed of 7 m/s), which sharply reduces the output of the entire system.

Full-scale field testing of new equipment systems will be conducted at a number of enterprises, and totally new mineral mining technologies will be developed -- an assembly-line process of rock excavation and ore mining on the basis of geological engineering methods.

Implementation of basic trends in improving open-pit mining equipment and technology at the mining enterprises of the USSR Ministry of Ferrous Metallurgy will make it possible sharply to increase labor productivity in basic processes and to obtain substantial savings.

3024
CSO: 1822

WATER

CONSTRUCTION OF RAINMAKING STATION IN ARMENIA

Yerevan KOMMUNIST in Russian 16 Jul 78 p 3

[Article by S. Markosyan, special correspondent of KOMMUNIST: "Meteotron Produces Rain"]

[Text] Scientists of different branches in science have been involved already for many years in solving the problem of conserving the water supplies of Lake Sevan. Measures have been taken to limit the passage of water for irrigation and power engineering, and construction is being completed of the underground channel Arpa-Sevan. To maintain the necessary microclimate on the mountain slopes surrounding the lake forests are being planted.

The All-Union Scientific Research Institute of Applied Geophysics of the USSR State Committee on Hydrometeorology and Control of the Environment has also been actively inlcuded in solving the problem of Sevan.

The correspondent of KOMMUNIST, S. Markosyan, met with the head of the department of cloud physics and cloud modification of this institute, doctor of physico-mathematical sciences, Professor N. Vul'fson, and asked him to answer a number of questions.

[Question] Scientific and technical progress and the growth in the population result in the depletion of sources of fresh water. What are the paths for creating the necessary stable supply of water resources?

[Answer] First of all--strict preservation of the natural reservoirs, such as Baykal, Sevan, and high-water rivers. Scientists of many countries are working on the problems of conserving and making rational use of the fresh-water supplies. A study of the possibilities of compensating for the rising consumption of water prompted the need to modify the atomsphere in order to increase the volume of precipitation in the regions of natural reservoirs and in the arid regions, in a word, wherever there is an additional

need for water. Our institute has selected as a subject of experiments Lake Sevan as the most favorable region on the recommendation of the country's hydrometeorological service. According to our calculations the economic utility of the work will be revealed most effectively.

[Question] Tell us, please, about the directions of your research.

[Answer] The idea of developing a meteotron--a machine capable of increasing the volume of precipitation, emerged long ago. The idea began to be implemented in 1970. In addition, we created in Sevan a field experimental base for systematic observations of the water balance in the basin. In the near future we will install an automated network for measuring the amount of water in the fallen snow.

The study uses especially equipped airplanes, and in operation are aerosol generators, and antiaircraft guns firing rockets filled with silver iodide. The goal of our research and experiments--to help Sevan preserve the water balance.

[Question] What has been done specifically up to now?

[Answer] Specialists--physicists, electronics engineers, hydrometeorologists and mechanics have completed the field experimental base for the scientific and material-technical equipping of the experiments and the systematic collection of meteorological data. A new laboratory structure is being built as the basis for the future branch of our institute and the new research center. The supermeteotron is being assembled.

[Question] What is the purpose of this unit?

[Answer] The supermeteotron is designed for cloud modification, concentration of moisture in them, and its precipitation in the assigned region. With the help of powerful air-breathing jet engines arranged in a star pattern a vertical flow of air is created that is heated to 1100 degrees and is discharged into the atmosphere to an altitude of several kilometers, with starting velocity on the order of 500 meters per second. This flow should promote the transformation of clouds which do not produce, or produce little precipitation into intensive producers. As a result, a torrential storm cloud should develop in the cloud layer. The proposed area of precipitation fall is 10-20 km^2. The super meteotron is engaged only under favorable meteorological conditions. The total power of the unit is about a million kilowatts. Unfortunately, both the construction and assembly work is going very slowly, and the completion dates have been carried over several times.

[Question] Who, besides the institute which you represent, is participating in the experimental work?

[Answer] There are many organizations, in particular, The Ukrainian Scientific Research Institute of the Hydrometeorological Service, the Yerevan department of the Transcaucasus Scientific Research Institute of the same profile, the

Institute of Mechanics of Moscow State University, and the Scientific Research Institute of Hydrometeorological Instrument Making. The draft of the supermeteotron was prepared by the Riga Polytechnical Institute, and the questions of the use of airplane engines in the system were answered in the Riga institute of civil aviation engineers.

The construction and assembly platform of the supermeteotron is located at a height of 2300 meters above sea level. We travel the last 1.5 kilometers by dirt road: the construction of a road, begun several years ago, has not been finished.

The assembly platform presentes a dejected picture. Grass has grown in the uninstalled parts of the afterburner, the fuel storage tanks are corroded, rusty pipes have been scattered in disorder on the area--the transfer system for the engine fuel supply system has not been assembled, and the engines themselves have not been covered. The quality of the concrete work does not lend itself to evaluation: pieces of concrete taken from the platform around the unit crumble in my hands without special force. The electric power transmission line has not been delivered, there is no water, and the booth for the control panel has been built "by eye" without observance of the specifications (one of the walls has begun to collapse). The only "living soul" at the construction site is the watchman.

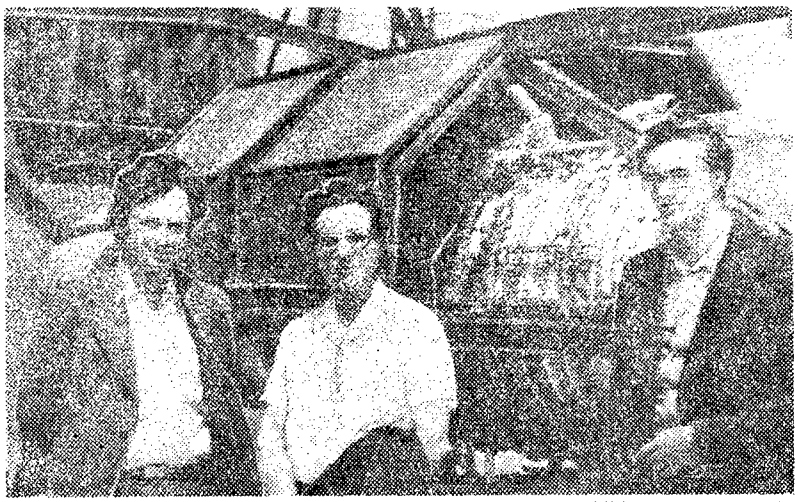
It was planned to complete construction back in 1977. The putting into operation of the unit "Supermeteotron" for artificial stimulation of precipitation in the basin of the lake was commissioned to the Ministry of Agriculture of the republic and the Main Administration of Assembly and Special Construction Work.

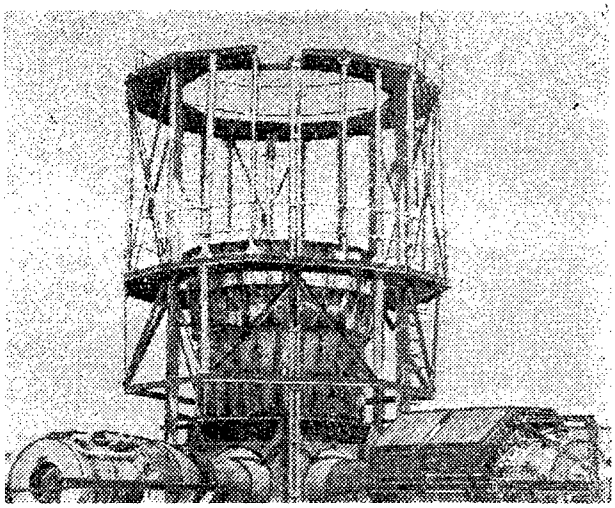
In May of last year at the technical conference of the deputy head of the Glavuprmontazhspetsstroy [Main Administration of Assembly and Special Construction Work] R. Pogosyan with the participation of interested organizations a schedule was compiled, according to which it was planned to complete all the assembly work by 10 July. On this same day the commission was appointed to receive the unit for starting-setup work.

Exactly a year has passed. During this time almost nothing has been done. The trust "Sel'stron" No 7 had to utilize in 1977 126,000 R (laying of the road, construction of warehouses, fire-fighting reservoir, and fences). Of this sum 56,000 R remain unrealized.

The last act in the checking of the condition of the assembly work compiled by the authors of the draft was dated 29 June 1978. The deficiencies in the assembly work are listed on three pages (the responsible party--the trust "Arprommontazh").

The second abandoned construction site is the laboratory structure in Sevan. The builders (the trust "Sevanstroy") assembled the framework of the building, then dismantled and took away the crane... The trust did not report to the bank the volume of work executed, and therefore the financing of the facility has been halted.





On the photographs: the afterburning tower of the supermeteotron; the head of the field experimental base M. Nakhumovich, the author of the idea for creating the cloud modification unit Professor N. Vul'fson, and the chief engineer of the assembly A. Skorbeyev (from left to right).

There are all the prerequisites to create a new scientific base in Sevan. Here promises to accelerate the construction are not needed, but decisive measures on the part of the Ministry of Agricultural Construction in the republic.

9035
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WATER

RAINMAKING IN GEORGIA

Moscow PRAVDA in Russian 28 Sep 78 p 2

[Article from TASS: "'Squeezing' Rain from Clouds"]

[Text] Rain that has freshened the autumn colors of the mountains started as a result of the accuracy of specialists of the experimental testing site for artificial rainmaking that has begun to operate. The experimental "field" for the scientists has become the mountainous region in the basin of the Iori River about a thousand square kilometers in area. Besides means of seeding the clouds the specialists have communications, radar stations, and instruments for measurement of the amount of rainfall.

It is planned in the republic in a short period to significantly increase due to irrigation the yield of many agricultural crops, especially in eastern Georgia--the main granary and grape supplier in the republic. The goal of the experimental production work conducted is to increase the supply of water, having "squeezed" it from the clouds. This method of searching for water resources is also applicable for other regions in the country.

The testing site of the Transcaucasus Scientific Research Hydrometeorological Institute is located in the neighborhood of two major reservoirs in the republic--the Sionskiy and Tbilisi. Scientists, having accumulated a lot of experience in controlling hail-carrying clouds calculated: by actively modifying the clouds the inflow of water from the mountains could be increased into these reservoirs roughly by 50-100 million cubic meters per year. It will be possible to increase by 15-20% the area of irrigated lands in the Sagaredzhoyskiy, Gardabanskiy, Tsiteltskaroyskiy, and other rayons of Georgia.

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